

Prepared for:
Keystone Pipeline Project



A Field Survey of Suitable Habitat and
Fish Sampling for the Topeka Shiner
(*Notropis topeka*) for the Keystone
Pipeline Project in Kansas and Missouri

ENSR Corporation
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Executive Summary

Field surveys were conducted at stream-crossings along the proposed Keystone Pipeline Project construction right-of-way (ROW) in Kansas and Missouri to identify reaches of suitable Topeka shiner (*Notropis topeka*) habitat, and to quantify type and abundance of fish species located at the designated survey areas, specifically to identify if Topeka shiners were present. Topeka shiner habitat surveys were conducted at stream-crossings from September 25 through 28, 2006. A total of 21 sites were visited during this initial habitat survey. Of the 21 sites, four sites were determined to have suitable Topeka shiner habitat, two sites were determined to have marginal Topeka shiner habitat, and two sites were determined to have poor Topeka shiner habitat. The remaining eight sites were considered to be unsuitable habitat for the Topeka shiner. Fish surveys were conducted from October 2 through 4, 2006, at all stream-crossings identified in the September habitat surveys as having standing water present at the site. Seines (6' X 30' or 6' X 8' – ¼" ace-mesh, as appropriate) were used to capture fish within a sample site comprised of 200 meters centered on the pipeline crossing. Fish surveys were conducted at sites 1 through 4, 7 through 10, and 14. A total of 4,246 individuals, representing 24 species, were captured and identified within these nine sites. Species richness ranged from one at site 1, to 15 at site 4. Topeka shiners were not captured at any location. Access was unavailable at one location in Kansas (milepost [MP] 666.6; Tributary of North Elm Creek), and one location in Missouri (MP 781.8; Tributary of Little Platte River) during the September and October surveys, and no site evaluations were conducted at these stream-crossings. On December 5, 2006, a habitat evaluation and fish survey was conducted at the tributary to the Little Platte River (MP 781.8), where access had previously been denied. Seining was used to capture fish in any un-frozen pools of water within the 200-meter survey corridor. Sixteen individuals were captured, however; none of them were Topeka shiners. Based on the accumulated site information, it does not appear that Keystone Pipeline construction would have any foreseeable negative effects on the Topeka shiner within the stream-crossings surveyed in Kansas and Missouri. Locality information for stream crossing surveys, photographs, and maps of survey sites can be found in the appendices of this report.

1.0 Purpose

The Topeka shiner (*Notropis topeka*) is a small endangered minnow that occurs in several drainage basins in Kansas and Missouri. The Topeka shiner and its habitat are protected by federal law under the Endangered Species Act. Construction projects, like the proposed Keystone Pipeline Project, are required to determine effects on endangered species as part of the ESA Section 7 Information Consultation process to assist the lead federal agency (Department of State) in the NEPA process. Topeka shiners can be directly impacted by pipeline crossings through channel degradation or water quality impacts from increased sedimentation. The species can also be impacted by disruption of its habitat during the primary spawning season. Accordingly, surveys were designed to meet the following objectives:

Objective 1. Characterize habitat along stream courses bisected by the proposed Keystone Pipeline Project.

Objective 2. Define stream reaches having suitable Topeka shiner habitat.

Objective 3. Determine where additional biological surveys might be warranted in order to avoid impacts of pipeline construction on Topeka shiner populations in Kansas and Missouri, and conduct surveys where indicated.

Specifically, the habitat at each stream-crossing within basins designated by the Kansas Department of Wildlife and Parks, and Missouri Department of Conservation was assessed relative to current understanding of life history requirements for this species. Subsequently, fish surveys were conducted to determine relative abundance of fish species with particular emphasis on determining if Topeka shiner populations were present.

Relevant Life History

Topeka shiners can occur in a variety of habitats ranging from pristine to relatively degraded environmental conditions. However, they typically inhabit headwater stream reaches having a high percentage of permanent pool macrohabitats, typified by clear waters with relatively stable temperatures (relatively cool in the summer

and relatively warm in the winter) due to ground water influences. Both emergent and submergent aquatic vegetation are characteristic of these permanent water bodies. These stream reaches might cease flowing in the summer or during cycles of low precipitation (droughts); however, the pools remain in contact with ground water seeps or springs allowing Topeka shiners to thrive in what might be rather marginal conditions for other species. Topeka shiners are negatively associated with complex community structures (high minnow species diversity), rarely co-occur with congeners, and therefore, are generally considered to be poor competitors. The presence of large piscivorous fishes (i.e., largemouth bass) has also been shown to negatively affect local populations of Topeka shiners, and may have led to local extirpations. Eutrophication, bank erosion, and increased turbidity associated with unrestricted access of livestock and high stocking rates along headwater habitats have been shown to have negatively affect Topeka shiner populations as well.

2.0 Methods

From September 25 through 28, and on December 5, 2006, the physical condition of stream courses and water quality parameters were estimated at 15 stream-crossings along the proposed Keystone Pipeline ROW in Kansas and Missouri (Appendices III and IV). During these initial site visits, the centerline of the crossing was determined using a Garmin etrex global positioning system (GPS) unit and UTM coordinates (NAD 83) provided by ENSR personnel. From the centerline, an evaluation site was delimited to include a stream reach 200 meters in length centered on the pipeline-crossing centerline. Within this stream reach, water quality parameters were estimated using a YSI 85 multi-parameter meter and a Lamotte model 2020 turbidity meter and included water and ambient temperatures, dissolved oxygen concentration, percent saturation, conductivity, turbidity, orthophosphate, nitrate, ammonia, alkalinity, and pH (**Table 1**). Physical conditions were characterized by estimating percent canopy cover, percent of stream impacted by livestock, percent of eroded stream bank, dominant substrate, and percent wet pool habitat within the 200-m stream reach (**Table 1**). Field notes recorded general landscape conditions and relative amounts of streamside vegetation and in-channel vegetation. In addition, GPS coordinates were recorded to mark the center, upstream, and downstream limits of the survey site (Appendix I). Photos were taken at all locations to document conditions (Appendix II). These data were used to categorize sites according to their potential to support Topeka shiner populations.

Subsequently, sites that had standing water present during the September habitat surveys were sampled from October 2 through 4, 2006, with seines (6' X 30' or 6' X 8' – ¼" ace-mesh, as appropriate) to determine the relative abundance of fish species (**Table 2**). An additional fish survey was conducted on December 5, 2006, at one location (MP 781.8; Tributary to Little Platte River) that had no access during the September and October surveys. A sample site was comprised of 200 meters centered on the proposed pipeline-crossing location. Short seine-hauls were made, and all individuals were transferred to a bucket containing freshwater. When numbers exceeded 50 individuals, specimens were transferred to a holding net secured in the stream channel. Small subsets (10 to 15 individuals) were placed sequentially in 16" X 6" X 1" aquaria so they could be identified and counted with minimal stress. All individuals were returned to the stream immediately after data collection.

3.0 Results

Physical Conditions and Water Quality

Sites were surveyed for suitable Topeka shiner habitat from west to east from September 25 through 28, and on December 5, 2006. For the purposes of this report, survey sites are numbered 1 through 15 with site-specific reference numbers, mile post numbers, localities, and water body names available in Appendix I. Water quality and physical conditions varied widely among the stream-crossings surveyed.

The most extreme conditions were observed at sites 5, 6, 11, 12, and 13, which were all completely dry at the time of surveys (Appendix II).

Sites 7 through 10, and 15 were intermittent streams, having no detectable flow at the time of surveys. These sites consisted of a few puddles (sites 7 and 8) to long, isolated pools, 12 to 16 inches deep (sites 9 and 10). Site 15 was surveyed later in the year and consisted of five pools having no connected flowing water. Four of

the five pools were completely frozen solid, and only one pool contained liquid water. Small fishes were observed at all five locations.

Sites 1 through 4 and 14 had the best combination of water quality and physical condition, in that flowing water occurred at all locations. Site 1 was a very small headwater stream with shallow pools (approximately 12 inches deep) and cobble substrates. Surface water was very clear, but no fish were observed along the survey reach. Site 14, in contrast, was the largest stream surveyed in Missouri. Flow was sluggish over silt substrates, and an abundance of large woody debris was deposited in the active channel. Although fish were undoubtedly present, the lack of water clarity precluded observations. Free-flowing water also was present at site 2, but the stream was shallow and had sand substrates with little distinctive pool-riffle habitat complexity or development. Sites 3 and 4 both had flowing water and well defined pool-riffle macrohabitats. The substrates at these two sites were coarse (cobble), and water clarity was good. Numerous fishes were observed at each locality.

Fish Surveys

Ten sites were surveyed for fish from west to east along the proposed Keystone Pipeline ROW from October 2 through 4, and on December 5, 2006 (**Table 3**). Fish surveys were conducted at sites 1 through 4, 7-10, and 14-15. A total of 4,262 individuals, representing 24 species, were captured and identified within these ten sites. Species richness ranged from 1 at site 1, to 15 at site 4. No Topeka shiners were sampled at any site. Seining was relatively straightforward at all sites because water levels and flow were both low, and channel obstructions were few, with the exception of sites 14 and 15. Accordingly, there is high confidence of the effectiveness of the sampling technique and the quality of samples at these sites. Site 14, on the East Fork of the Chariton River, was difficult to sample due to the large woody debris deposited in the active channel. Compensation was made by making shorter seine hauls throughout the 200-meter survey reach. Although the total number of fish was low (128) compared to most other sites, species richness was the second highest and included benthic forms (three percids) that are generally more difficult to capture in these habitats. Removal of surface ice at site 15 before seining the one pool containing liquid water was the only other modification to the standard seining protocol. However, the removal of ice had no influence on sample quality given the very small volume of water available to sample.

Access was unavailable at one location in Kansas (MP 666.6; Tributary of North Elm Creek). Therefore, no site evaluations were conducted at this basin.

4.0 Discussion

Based on the physical site evaluation, basic water quality estimates, and field observations, sites 3 and 4 were considered to have habitat most suitable to support Topeka shiner populations. Sites 1 and 2 were considered to have marginal habitat, and sites 9, 10, and 15 were considered to have poor Topeka shiner habitat. All other sites were considered very poor and highly unlikely to support Topeka shiner populations. However, Topeka shiners are notorious for persisting in headwater streams during low flow seasons and determining the relative permanence of habitats as the result of a single site visit is difficult at best. In addition, fish surveys were conducted to determine presence/absence of Topeka shiners and the relative abundance of other species at all sites that had at least some surface water. Topeka shiners were not captured at any location. Therefore, based on the accumulated site information, it seems highly unlikely that pipeline construction would have any foreseeable negative affect on the Topeka shiner within the basins surveyed (one site number equals one basin) in Kansas and Missouri. Keystone will consult with the agency to confirm that no additional surveys are required.

It also should be mentioned that the Keystone Pipeline Project will cross North Elm Creek in two locations in Marshall County, Kansas. These streams were not assessed during this field survey because they are designated as critical habitat by the Kansas Department of Wildlife and Parks for the Topeka shiner.

Table 1 Estimates of Water Quality Parameters for Stream Crossings in Kansas and Missouri (Site Numbers Correspond to Appendix I)

Site	D. O. mg/L	% SAT	Turbidity ntu	Conductivity mS	Water Temp. °C	Air Temp. °C
1	11.49	99.4	9.7	551	16.4	23.3
2	8.02	78.6	7.0	357.4	14.1	17.8
3	6.38	85	26	172.2	17.3	30.3
4	7.49	81.6	16	323.7	20.1	28.2
5	-	-	-	-	-	26.3
6	-	-	-	-	-	18.6
7	5.86	54.2	5.9	352.4	15.2	17.8
8	4.57	32.6	6.3	332.7	17.6	20.7
9	8.01	83.4	4.4	174	15.8	22.1
10	9.0	88.6	7.7	188.7	18.6	16.0
11	-	-	-	-	-	18.3
12	-	-	-	-	-	19.5
13	-	-	-	-	-	9.8
14	8.42	85	15	353.5	15.1	12.3
15	4.86	31.7	-	329.8	3.4	1.6

Site	Phosphate (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)	Alkalinity (mg/L)	pH
1	0.204	4.4	0.116	221	8.6
2	0.16	4.4	0.83	88.4	8.4
3	0.5	4.4	nt	61.2	8.3
4	0.2	nt	nt	94.8	8.0
5	-	-	-	-	-
6	-	-	-	-	-
7	nt	nt	nt	94.8	8.4
8	0.46	6.6	nt	6.12	7.9
9	1.08	nt	nt	95.2	8.0
10	0.14	nt	nt	91.8	8.2
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	0.04	nt	nt	4.72	8.6
15	nt	nt	nt	425	8.5

nt = not detectable; water quality parameter was taken; however, value was below the detectable limit of the meter.

Table 2 Physical Conditions of the Stream Course at Stream Crossings of the Keystone Pipeline Project in Kansas and Missouri September 25 through 28, and on December 5, 2006 (Site Numbers Correspond to Appendix I)

Site	% Wet Channel	% Dry Channel	% Channel Impact by Livestock	% Channel with Eroded banks	Dominant Substrate	% Canopy Cover
1	100	0	0	0	Cobble	50
2	100	0	0	0	Sand	40
3	100	0	0	15	Cobble	20
4	100	0	0	0	Sand/Cob.	75
5	0	100	0	10	Pebble	50
6	0	100	0	20	Sand	70
7	25	75	0	15	Sand	75
8	30	70	0	10	Bed/Sand	100
9	70	30	0	0	Cobble	75
10	100	0	0	0	Cobble	50
11	0	100	0	0	Sand	10
12	0	100	0	0	Sand	25
13	0	100	0	0	Silt	0
14	100	0	0	100	Silt	75
15	50	50	0	0	Sand/Gravel	50

Table 3 Fishes Captured and Released during Topeka Shiner Surveys October 2 through 4, and December 5, 2006

Species	Number of Individuals Captured at each Site									
	Site 1	Site 2	Site 3	Site 4	Site 7	Site 8	Site 9	Site 10	Site 14	Site 15
Gizzard Shad	---	---	4	---	---	---	---	---	---	---
Topeka shiner	---	---	---	---	---	---	---	---	---	---
Bigmouth shiner	---	272	---	13	12	91	---	139	---	---
Bluntnose minnow	---	---	---	68	---	52	1	19	---	---
Bullhead minnow	---	---	---	---	---	---	---	---	35	---
Central stoneroller	---	43	---	122	10	88	57	16	---	---
Creek chub	---	73	---	129	36	159	295	100	---	1
Emerald shiner	---	---	---	---	---	---	---	---	5	---
Fathead minnow	7	60	---	453	5	19	4	6	---	---
Golden shiner	---	---	1	39	---	---	---	---	---	1
Red shiner	---	412	102	176	2	57	---	13	59	---
Redfin shiner	---	6	173	6	---	---	---	---	---	---
Sand shiner	---	252	9	1	---	---	---	1	---	---
Suckermouth minnow	---	1	---	1	---	---	---	---	---	---
River carpsucker	---	20	---	---	---	---	---	---	---	---
White sucker	---	---	---	4	8	---	---	---	---	---
Channel catfish	---	---	---	---	---	---	---	---	3	---
Brook silverside	---	---	---	---	---	---	---	---	1	---
Bluegill	---	11	115	61	14	20	1	7	4	---
Green sunfish	---	17	6	2	28	153	---	27	7	14
Largemouth bass	---	---	1	1	---	---	---	---	4	---
White crappie	---	---	6	---	---	---	---	---	---	---
Blackside darter	---	---	---	---	---	---	---	---	1	---
Johnny darter	---	---	---	21	---	---	---	---	4	---
Logperch	---	---	---	---	---	---	---	---	5	---
Total	7	1167	417	1097	115	639	348	328	128	16
Species Richness	1	11	9	15	8	8	5	9	11	3

Appendix I

**Locality Information for Stream Crossing Surveys Conducted in
Kansas and Missouri**

Table I-1 GPS Waypoints for Topeka Shiner Survey Sites in Kansas and Missouri

Site	Locality	Stream	Source	UTM Datum	X	Y
1 MP 659.5	T-WS1-KSMA-001	Tributary To North Elm Creek	ENSR	14S	705634	4427670
			Center	14S	705610	4427654
			Upstream	14S	705654	4427603
2 MP 772.9	T-WS1-MOCL-001	Castile Creek	Center	15S	368815	4387940
			Downstream	15S	368847	4387873
3 MP 780.8	T-WS1-MOCL-002	Little Platte River	Center	15S	381509	4386262
			Downstream	15S	381519	4386194
4 MP 785.5	T-WS1-MOCL-003	Shoal Creek	Center	15S	388983	4384940
			Upstream	15S	388981	4384873
5 MP 786.2	T-WS1-MOCL-004	Little Shoal Creek	Center	15S	390099	4384728
6 MP 794.5	T-WS1-MOCA-001	Log Creek	ENSR	15S	402981	4383032
			Center	15S	403008	4383041
7 MP 795.5	T-WS1-MOCA-002	Tributary to Log Creek	ENSR	15S	404601	4382629
			Center	15S	404631	4382639
			Downstream	15S	404642	4382703
8 MP 796.2	T-WS1-MOCA-003	Tributary to Log Creek	ENSR	15S	405889	4382343
			Center	15S	405920	4382327
			Upstream	15S	405875	4382276
9 MP 801.2	T-WS1-MOCA-004	Brush Creek	ENSR	15S	413700	4381029
			Center	15S	413753	4381008
			Upstream	15S	413678	4380912
10 MP 804.5	T-WS1-MOCA-005	Crabapple Creek	ENSR	15S	419018	4380337
			Center	15S	418992	4380343
			Upstream	15S	418985	4380352
11 MP 803.5	T-WS1-MOCA-006	Tributary to Crabapple Creek	ENSR	15S	417242	4380552
			Center	15S	417034	4380551
12 MP 801.7	T-WS1-MOCA-007	Tributary to Brush Creek	ENSR	15S	414598	4380847
			Center	15S	414565	4380892
13 MP 872.2	T-WS1-MOCH-001	Tributary to East Fork Chariton River	ENSR	15S	525025	4360236
			Center	15S	525070	4360207
14 MP 871.5	T-WS1-MOCH-002	East Fork Chariton River	ENSR	15S	524003	4360356
			Center	15S	524087	4360372
			Downstream	15S	524121	4360341
15	T-WS1-MOCL-005	Tributary to Little Platte River	ENSR	15S	383082	4386021

Table I-1 GPS Waypoints for Topeka Shiner Survey Sites in Kansas and Missouri

Site	Locality	Stream	Source	UTM Datum	X	Y
MP 781.8						
			Center	15S	383121	4386105
			Upstream	15S	383100	4386170
			Downstream	15S	383211	4386029

Table I-2 Locality information for Topeka Shiner Survey Sites in Kansas and Missouri

Site Number	Feature Number	State	County	Mainline Milepost	Waterbody Name
1	T-WS1-KSMA-001	KS	Marshall	659.5	Trib. North Elm Creek
2	T-WS1-MOCL-001	MO	Clinton	772.9	Castile Creek
3	T-WS1-MOCL-002	MO	Clinton	780.8	Little Platte River
4	T-WS1-MOCL-003	MO	Clinton	785.5	Shoal Creek
5	T-WS1-MOCL-004	MO	Clinton	786.2	Little Shoal Creek
6	T-WS1-MOCA-001	MO	Caldwell	794.5	Log Creek
7	T-WS1-MOCA-002	MO	Caldwell	795.5	Trib. of Log Creek
8	T-WS1-MOCA-003	MO	Caldwell	796.2	Trib. of Log Creek
9	T-WS1-MOCA-004	MO	Caldwell	801.2	Brush Creek
10	T-WS1-MOCA-005	MO	Caldwell	804.5	Crabapple Creek
11	T-WS1-MOCA-006	MO	Caldwell	803.5	Trib. of Crabapple Creek
12	T-WS1-MOCA-007	MO	Caldwell	801.7	Trib of Brush Creek
13	T-WS1-MOCH-001	MO	Chariton	872.2	E. Fork Chariton River
14	T-WS1-MOCH-002	MO	Chariton	871.5	E. Fork Chariton River
15	T-WS1-MOCL-005	MO	Clinton	781.8	Trib. of Little Platte River

Note: Access was refused at the following stream-crossing: 1) Kansas: Marshall Co.; MP 666.6; Tributary North Elm Creek.

Appendix II

Survey Site Photos



Figure II-1 Feature T-WS1-KSMA-001; Kansas; Marshall Co.; MP 659.5; Trib. North Elm Creek; east Channel



Figure II-2 Feature T-WS1-MOCL-001; Missouri; Clinton Co.; MP 772.9; Castile Creek; south



Figure II-3 Feature T-WS1-MOCL-002; Missouri; Clinton Co.; MP 780.8; Little Platte River; south



Figure II-4 Feature T-WS1-MOCL-003; Missouri; Clinton Co.; MP 785.5; Shoal Creek.; east



Figure II-5 Feature T-WS1-MOCL-004; Missouri; Clinton Co.; MP 786.2; Little Shoal Creek; north



Figure II-6 Feature T-WS1-MOCA-001; Missouri; Caldwell Co.; MP 794.5; Log Creek; west



Figure II-7 Feature T-WS1-MOCA-002; Missouri; Caldwell Co.; MP 795.5; Trib. of Log Creek; downstream

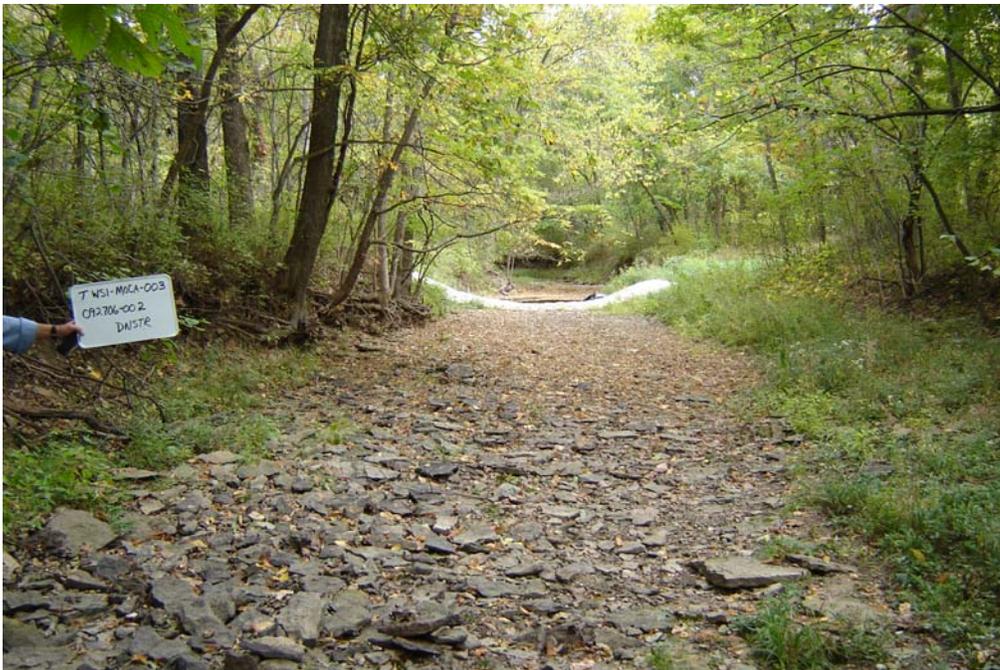


Figure II-8 Feature T-WS1-MOCA-003; Missouri; Caldwell Co.; MP 796.2; Trib. of Log Creek; downstream



Figure II-9 Feature T-WS1-MOCA-004; Missouri; Caldwell Co.; MP 801.2; Brush Creek; downstream



Figure II-10 Feature T-WS1-MOCA-005; Missouri; Caldwell Co.; MP 804.5; Crabapple Creek; downstream



Figure II-11 Feature T-WS1-MOCA-006; Missouri; Caldwell Co.; MP 803.5; Trib. of Crabapple Creek; downstream



Figure II-12 Feature T-WS1-MOCA-007; Missouri; Caldwell Co.; MP 801.7; Trib of Brush Creek; downstream



Figure II-13 Feature T-WS1-MOCH-001; Missouri; Chariton Co.; MP 872.2; Trib. E. Fk. Chariton River; downstream



Figure II-14 Feature T-WS1-MOCH-002; Missouri; Chariton Co.; MP 871.5; E. Fork Chariton River; upstream



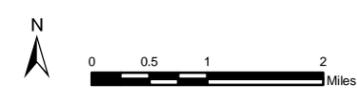
Figure II-15 Feature T-WS1-MOCL-005; Missouri; Clinton Co.; MP 781.8; Tributary to Little Platte River; pool

Appendix III

Maps of Survey Sites in Kansas

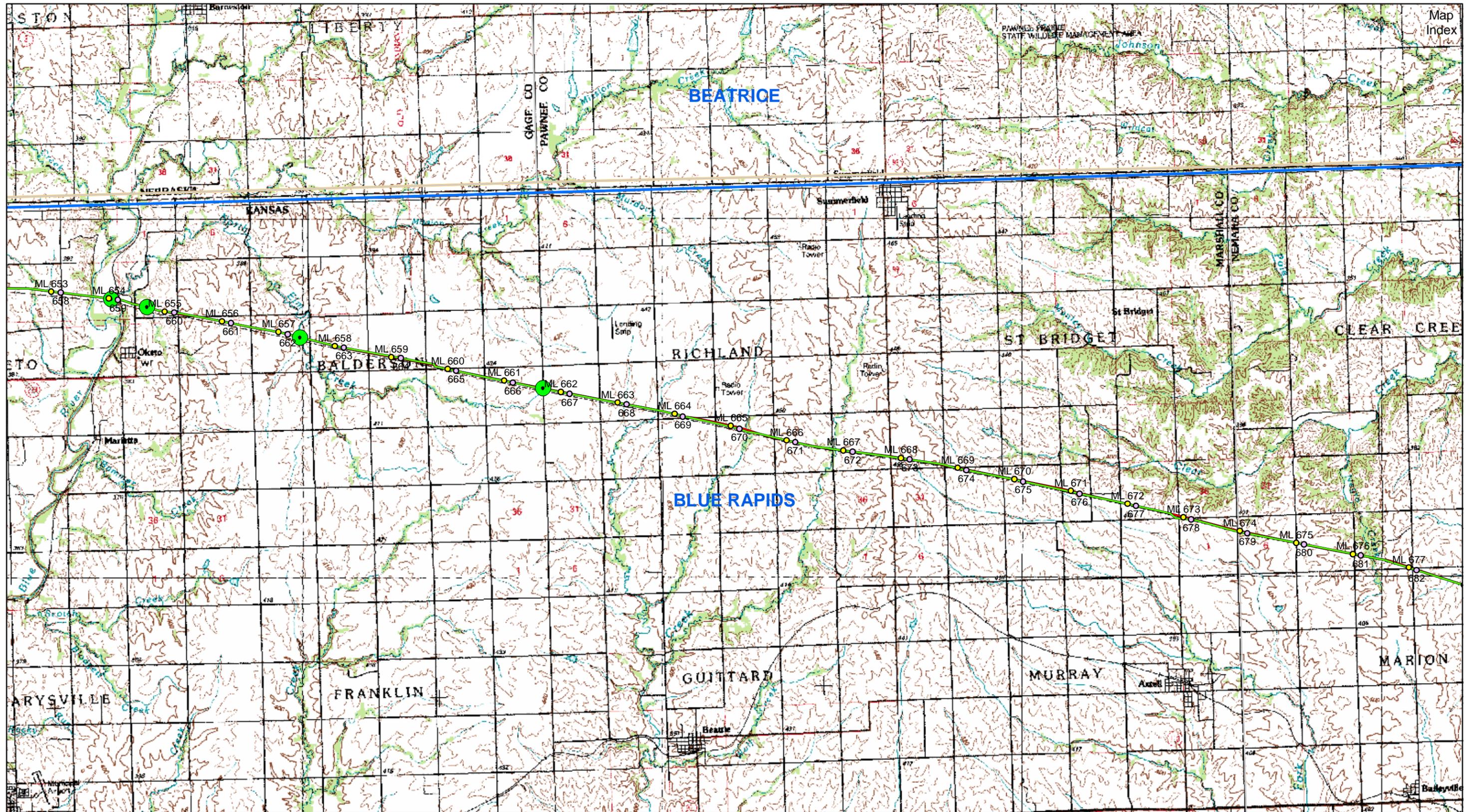


- Topeka Shiner Mileposts (8/17/06)
- Mileposts (2/9/06)
- Pipeline (8/17/06)
- Pipeline (2/9/06)



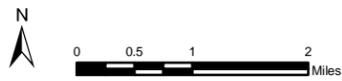
Keystone Pipeline Project

Map 1 of 2
General Project Location
(Kansas)



Map Index

- Topeka Shiner
- Mileposts (8/17/06)
- Mileposts (2/9/06)
- Pipeline (8/17/06)
- Pipeline (2/9/06)



Keystone Pipeline Project

Map 2 of 2
General Project Location
(Kansas)

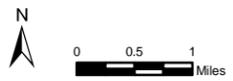
Appendix IV

Maps of Survey Sites in Missouri



-  Topeka Shiner
-  Mileposts (8/17/06)
-  Mileposts (2/9/06)
-  Pipeline (8/17/06)
-  Pipeline (2/9/06)

N



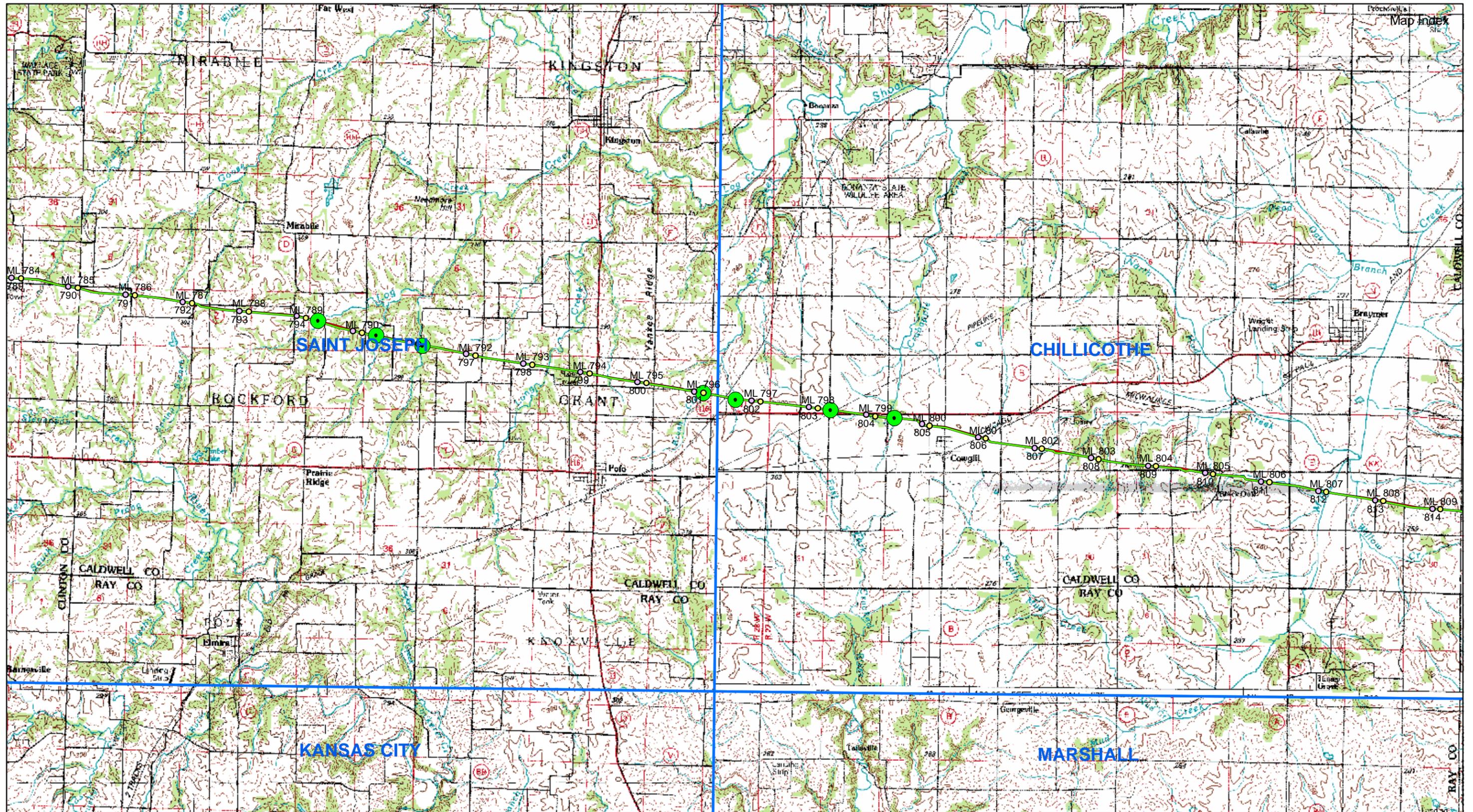
0 0.5 1 Miles

Keystone Pipeline Project



TransCanada
In business to deliver

Map of 1 of 3
General Project Location
(Missouri)



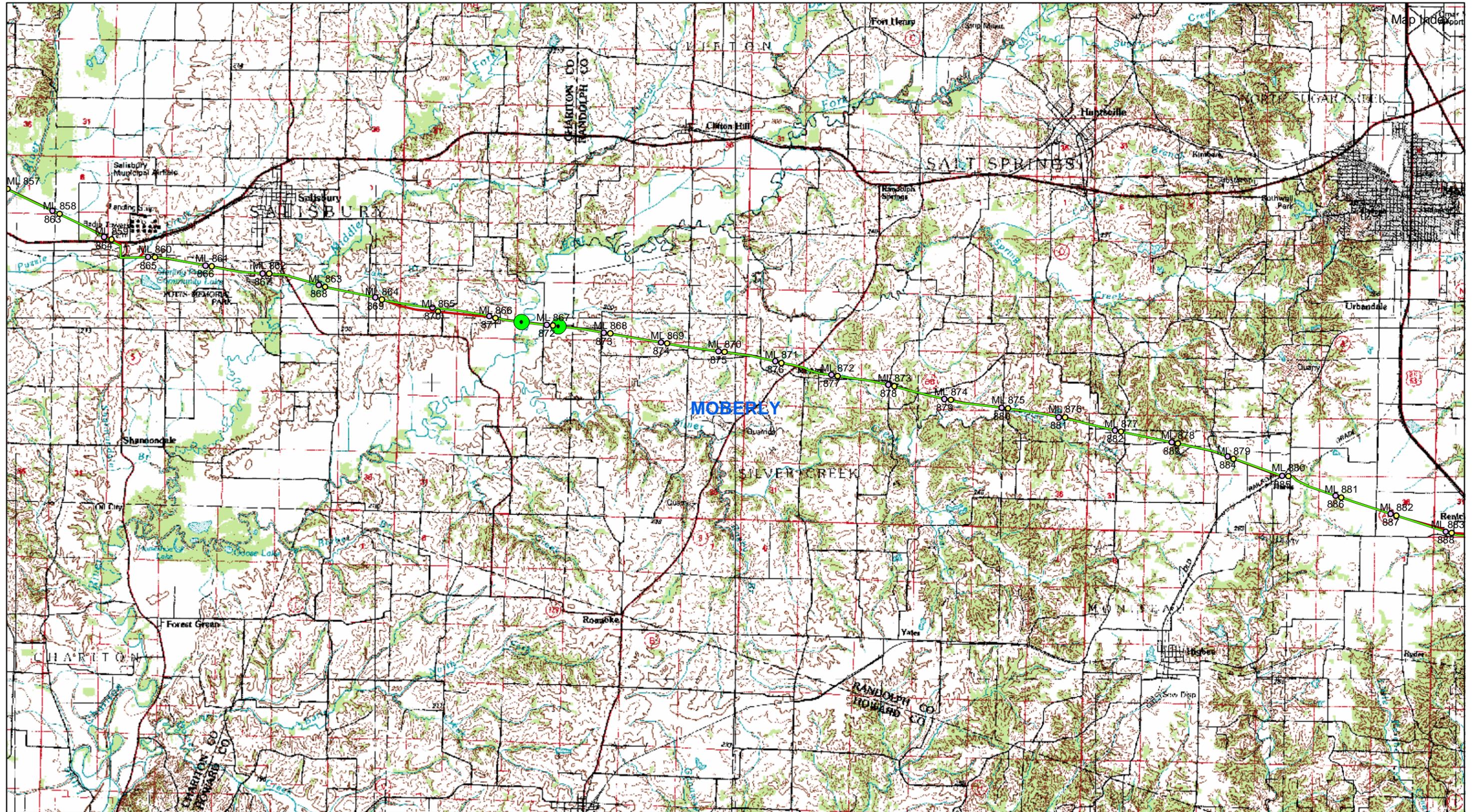
- Topeka Shiner
- Mileposts (8/17/06)
- Mileposts (2/9/06)
- Pipeline (8/17/06)
- Pipeline (2/9/06)

N

0 0.5 Miles

Keystone Pipeline Project

Map of 2 of 3
General Project Location
(Missouri)



- Topeka Shiner
- Mileposts (8/17/06)
- Mileposts (2/9/06)
- Pipeline (8/17/06)
- Pipeline (2/9/06)

N

0 0.5 Miles

Keystone Pipeline Project

TransCanada
In business to deliver

Map of 3 of 3
General Project Location
(Missouri)